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THE DAMAGING EFFECTS OF ALCOHOL: CHRONIC AND PATTERN
ALCOHOL USE EXPLAIN WHY SEXUAL ASSAULT FIGURES HAVE
NOT SIGNIFICANTLY DROPPED IN THE UNITED STATES MILITARY

by

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Abstract

Sexual assaults in the U.S. military services are still occurring at high rates because a critical underlying factor has not been identified and targeted preventive measures have not been incorporated into current strategy. The purpose of this study was to evaluate facts and information to produce a total true picture of the underlying problem. In this study, current military policy and primary source information is reviewed and collated to determine the common denominators between chronic and pattern alcohol consumption, antisocial behaviors and sexual assault. Results indicate recent discoveries in the field of neuroscience have proven chronic pattern and binge consumption of alcohol causes vast neurological damage affecting executive/cognitive functions, emotional regulation, and behavior.¹ Neurological damage caused by chronic and binge alcohol consumption is a primary causative factor in antisocial behaviors related to sexual assault. The recommended way ahead for the DoD is to fund an outside scholarly source to produce an educational plan covering the damaging effects of alcohol as it relates to neurological damage, antisocial behavior and sexual assault. It is also recommended that this educational plan be handed off to a newly created a joint integrated process team between the Joint Sexual Assault Prevention (SAPR) and Alcohol and Drug Abuse Prevention (ADAPT) programs. Leaders will then be able to carve out implementation policy and tools for commanders to utilize at all levels of service. Finally, senior leaders overseeing the SAPR program are urged to include an alcohol involvement perimeter within reporting procedures. This will create a measureable data point to demonstrate changes in the number of sexual assaults once programmatic changes have been made.

INTRODUCTION

Overview of the Study

Sexual assault in the military is a highly controversial and debated topic. Men and women alike, who chose to serve and defend our country, are being wounded by an internal enemy, which is the worst kind. During Operation Enduring Freedom/Operation Iraqi Freedom alone, 18% of 1,337 surveyed reported they were sexually assaulted and the reports are rising.² Sexual assault reports in the military have increased and not decreased with program and policy changes. The percentage of reported sexual assault incidents is much greater in the U.S. military than in the U.S. as a whole (28% of active duty Air Force women (alone) reported sexual assault as opposed to 13% in the national sample).^{3, 4, 5} It is a highly relevant and severe problem that has critical impacts on mission readiness, mission accomplishment and individual health.⁶ The trouble with the DoD's current sexual assault prevention strategy is it does not target a major source of the problem; alcohol abuse which leads to antisocial behaviors and sexual assault. Experts in the field indicate alcohol intoxication is involved in a majority of sexual assaults.⁷

The problem of sexual assault is not just a consent issue while intoxicated; it is an abuse or addiction issue that causes validated changes in the brain's integrity and white matter over time. These changes in the brain's structure (neurological changes) lead to the antisocial behaviors associated with sexual assault. The changes or effects to the neurological system include lack of empathy, inability to control impulses, lack of executive functioning, poor judgment, lack of insight and inability to plan or make sound decisions. In order to understand the whole picture and identify a core problem, the current strategy in place that addresses sexual assault must be understood.

Current Strategy

In Feb of 2004, the Secretary of Defense, Donald H. Rumsfeld, directed a review of the DoD's processes involved in the treatment and care of victims of sexual assault.⁸ A task force was established to conduct the review with a recommendation for the formation of the Joint Task Force for Sexual Assault Prevention and Response. In Jan 2005, the DoD proposed DoD Directive 6495.01 to congress as policy and DoD Instruction 6495.2 was approved in October 2005.^{9,10} Across every service, a cadre of first responders (Sexual Assault Response and Prevention Coordinators (SARCs), lawyers, chaplains and law enforcement agents), was trained and equipped to foster reporting and provide care to victims. The creation of a support structure was long overdue and garnered success with gradual increases in reporting rates over the next decade. The goal of encouraging reporting rates was met, but the underlying cause has still not been effectively addressed. The only gauge services have to understand how many sexual assaults are actually occurring is the amount of sexual assault reports made; which is counter intuitive. Many more could actually be taking place, but not reported. Service members are becoming more secure regarding reporting sexual assault incidents, but the continued increase in reporting rates indicate the core issues have not been tackled. An emphasis has not been made through policy to target the underlying cause of sexual assault. In the 2013 SAPR report, the USMC included a significant data perimeter on the report starting on page 20.¹¹ In this report, 53% (138 of 259) of the sexual assaults document alcohol involvement. Although alcohol involvement was not the emphasis of the report, the data is critically significant and requires further analysis and documentation in metrics in future surveys. This statistic, alone, in a public military report is enough to warrant an inquiry into alcohol use patterns as it relates to sexual assault. A critical clue in the total data roll up is missing; alcohol involvement documentation.¹²

It is unknown how many of the total reported sexual assaults involved alcohol use. Other statistical reports indicate 32% of males in the military engage in problematic drinking and the statistics are also just as high for females.¹³ This very important data collection perimeter in the SAPR reporting process has been missed. Alcohol abuse and sexual assault have a common factor; antisocial behavior patterns.

Nature of the Problem

Over the last few decades in the medical community, new diagnostic imaging technology and advances in neuroscience have proven that even moderate alcohol consumption affects the brain's structure and causes chronic cognitive and behavioral problems.^{14, 15} Many primary source articles also find similarities between antisocial personality behaviors and brain structures (lack of empathy and impulse control) and chronic drinkers. These are the same antisocial behaviors present in sexual assaults. The longer the drinking behavior occurs over time (along with the amount), the more potential for damage to the brain in areas that affect decision making abilities (cognitive and executive functioning) or in emotional processing centers/areas.^{16, 17} Research has also demonstrated alcohol use can affect the brain and behavior in a variety of ways and the extent of brain damage may be associated age, gender, drinking history, and nutrition, as well as with the vulnerability of specific brain regions.¹⁸ Nutrition is an especially hard driving vulnerability factor considering consistent alcohol use damages the microvilli in the small intestines and prevents nutrient absorption. Even with vitamin supplementation while continuing to consume alcohol, the body still cannot absorb the nutrition and passes it through the urine instead. It has been well established that thiamine (B1) deficiency is a common place occurrence among drinkers and is also responsible for significant white matter damage. Other nutritional deficiencies caused by alcohol consumption affect different parts of the brain and

organ systems; which is also well established and documented. Damage to other organ systems is beyond the scope of this research paper as the analysis section with focus mainly on alcohol consumption as it relates to neurological damage associated with antisocial behavior. A service related circumstance to consider is alcohol with-draw symptoms for those pattern or heavy drinkers who deploy into regions where general order number one is enforced. If a service member's nutritional system is not stabilized, the member could develop Wernicke's encephalopathy in theater and/or further develop Wernicke-Korsakoff syndrome. Wernicke's encephalopathy is damage to the lower parts of the brain known as the thalamus and hypothalamus. Korsakoff syndrome is permanent damage to these regions. Another service related factor to consider is the isolation of service members from family members often drives them into coping drinking patterns. Pattern, binge and heavy alcohol consumption damages the often unaware service member's brain and sets the stage for making impulsive or poor moral choices.^{19, 20, 21} Alcohol misuse does cause brain damage. This sets the conditions that lead to sexual assaults; alcohol misuse and sexual assaults are correlated. There is much more to be known and understood about the nature of this correlation. Like any other course of action development for a major theater campaign, centers of gravity need to be identified. In this case, alcohol abuse is a heavy center of gravity in the campaign against sexual assault. The underlying causes need to be understood with changes incorporated into the DoD's overall sexual assault strategy. The problem is our current senior military leaders and policy makers do not understand the correlation clearly and, thus, have not incorporated necessary targeted changes to military strategy and policy.

Purpose of the Study

While there are many side topics that factor into sexual assault, the purpose of this research paper is to investigate and illuminate the direct link between antisocial behaviors, alcohol abuse and sexual assault through statistics and primary source research. The aim of this study is to evaluate the facts and information to produce a total true picture of the relationship. If the nature of the problem is understood, more finely tuned courses of action can be developed and protective measures can be established to defend our service members from harm. To do this, the right questions must be asked.

Research Question

After researching sexual assault across the military, the civilian population and college campuses, two common factors stood out: antisocial behavior and alcohol. In order to understand the nature of antisocial behavioral causes and risk factors, it was necessary to include psychopathy and other personality disorder characteristics into the research. In addition, the medical community has documented a plethora of information regarding psychopathy, neurological damage due to alcohol abuse and associated structural changes in the brain. Finally, the law enforcement community has documented the use of alcohol in the majority of sexual assault cases. However just like military reports on the subject, not all victims or perpetrators admit to using alcohol which indicates the number could be much higher. This research answers the question, “What are the common denominators between chronic and pattern alcohol consumption, antisocial behaviors and sexual assault?”

Research Methodology

This paper is structured as a problem/solution framework, identifies potential ways the DoD could reduce sexual assault in the military and recommends the best course of action the

DoD can take to reduce sexual assaults across the joint force. The literature review establishes a clear connection between alcohol misuse/abuse and sexual assault utilizing primary research across schools of thought. The analysis identifies potential courses of action followed by conclusions and recommendations.

Literature Review

Most of the suggested strategies involve identifying alcohol abuse after the sexual assault has occurred. Many researchers who have attempted to understand why sexual assault figures are so high in the military examine factors such as socio-demographics, prevalence rates of prior military sexual abuse or perpetration, military culture as a promoter, emphasis on violence and hyper masculinity.²² While it is clear these factors do bare some relevance, it is not the full picture.

A Systemic Lens is Required

Research on the topic, from specific schools of thought, tend to view the topic through a compartmentalized lens and renders a narrow view. A psychologist will analyze a set of behaviors and attempt to classify the behavior(s) according to either the International Classification of Diseases or the Diagnostic and Statistical Manual of Mental Disorders. They could be treating a service member for post-traumatic stress or depression when the real underlying cause is long term alcohol misuse. Likewise, a neurologist will attempt to understand a specific behavior as it relates to structural functioning. This member could be diagnosed with an antisocial personality disorder or another personality disorder cluster, but the cause of the behaviors is white matter damage due to long term alcohol abuse. A medical doctor will find young troops visiting at sick call with a certain set of symptoms, but is unable to identify that the cause is related to alcohol abuse. Moreover, a sexual assault advocate or investigative officer

could take a report from a service member who was a victim of alcohol related sexual assault or a perpetrator and not see the need to encourage treatment for alcohol damage. If a systemic approach is taken, then research across schools of thought can establish a direct link between alcohol abuse and sexual assault by demonstrating changes in executive, cognitive and emotional functioning due to alcohol consumption and explain why this happens. It is the effects of alcohol that creates the platform and conditions for sexual assault.

Examples of Failed Recommendations

Importantly, many scientists have independently identified the connection between alcohol abuse and sexual assault, but have failed to influence policy in the correct manner to effect change; while others have not effectively addressed the underlying causes. These researchers have missed the center of gravity, per se. For instance, Turchik and Wilson suggested in their review that increased screening take place upon entry into the military to filter out potential recruits with previous sexual abuse or histories of violent crimes.²³ These recommendations do not completely address the causes or solve the problem as many would deny any previous sexual abuse to gain entry into the services and filters are already in place to screen for criminal histories. The platform argued here is recidivism instead of underlying causes.

Turchik and Wilson also argued that military commanders have too much authority over how sexual assaults are reported over the legal system and that authority should be more limited.²⁴ This is an unreasonable suggestion as commanders serve as the templates for military culture and are chosen as trusted agents. Commanders are the frontline defense against sexual assaults and are clearly not the problem. How sexual assaults are dealt with after they occur is a separate issue. Others have simply suggested that change needs to take place, without offering how

implementation should occur. Civilian scholars, who are employed outside of the military construct, do not have the insight into DoD processes to effect real change in the military. Leaders can, however, learn from civilian scholar's observations and scientific data to carve a way ahead. Implementing changes in our data collection and reporting processes will yield information supporting additional changes in medical screening processes (which might also include blood testing for vitamin deficiencies, chronic alcohol use or other periodic screening). Leaders have also missed a very important educational opportunity for our service members. Implementing an annual alcohol education program that is current, and includes recent medical and nutritional information, within our SAPR or Alcohol and Drug Prevention Treatment (ADAPT) programs (or both), DoD wide, could potentially reduce the amount of sexual assaults. Advancement in information technology has created a smarter generation of service members. It is not simply good enough to say do not do something. Young up and coming leaders deserve to know why they should not drink over the recommended daily limits and how misuse could affect their future abilities. The current strategies are simply not reducing the amount of sexual assaults. In the alternatives and recommendations section of this paper, it will be specified exactly what changes need to occur to DoD policy, in the SAPR program and the ADAPT Program. The moral example and change in culture is established through knowledgeable commanders, targeted policies and educated youth.

The Significance of Statistics

In order to get a clear idea of the frequency of sexual assault and alcohol abuse in the population, it is necessary to consider overall statistics. Statistics can also deliver clues to hidden relationships. The first significant statistic was mentioned in the 2013 SAPR report by the USMC and was covered in the introduction (53% or 138 of 259 of the reported assaults

document alcohol involvement).²⁵ As previously stated, statistics derived from SAPR reports indicate that any numbers previously collected were not accurate representations of the military population due to the fact that sexual assault reports are continuing to increase. The second significant study comes from a ground breaking report in 2010 covering sexual assault at historically black college campuses. The report concluded that the rates of sexual assault at these campuses were lower than non-historically black campuses mainly due to less alcohol consumption.²⁶ In the overall U.S. population, sexual assault is as frequent as 1 in every 5 women (18.3%) and 1 in every 71 men (1.4%) according to a 2010 national sample.²⁷ Unfortunately, the report does not mention how many sexual assaults were specifically alcohol related. Alcohol abuse percentages in the US population are striking. In a 2013 national survey it was reported 24.6% were binge drinking in the past month and 6.8% reported heavy drinking over the same duration.²⁸ The table below lists the overall captured sample and combined usage in 2013 at 56.3%. If the overall alcohol usage figure from this report is compared with the USMC sexual assault figure from the 2013 SAPR report (53%), it appears to be on par with a difference of approximately plus or minus 4%. Binge drinking statistics in the military are startling and well above the U.S. population sample. According to the National Institute on Drug Abuse, 47% of military members reported binge drinking in 2008 with 20% binge drinking every week over the past month. This report does not include heavy alcohol use data.³⁰ A very clear picture emerges, with nearly half of the military force falling victim to alcohol misuse issues, which is far above the U.S. data depicting alcohol misuse in the US population. It is very likely that most of the military force and the U.S. population do not know what the standard safe drinking limits are.

Table 1. 2013 National Survey on Drug Use and Health (NSDUH)²⁹**Table 2.46B – Alcohol Use, Binge Alcohol Use, and Heavy Alcohol Use in the Past Month among Persons Aged 18 or Older, by Demographic Characteristics: Percentages, 2012 and 2013**

Demographic Characteristic	Alcohol Use (2012)	Alcohol Use (2013)	Binge Alcohol Use (2012)	Binge Alcohol Use (2013)	Heavy Alcohol Use (2012)	Heavy Alcohol Use (2013)
TOTAL	56.3	56.4	24.6	24.6	7.1	6.8
GENDER						
Male	61.5	62.2	33.0	32.8	10.9	10.4
Female	51.4	51.0	16.8	17.0	3.6	3.5
HISPANIC ORIGIN AND RACE						
Not Hispanic or Latino	58.0	57.9	24.4	24.2	7.3	7.1
White	61.2	61.6	25.3	25.5	8.1	7.8
Black or African American	47.6	47.8	22.8	22.1	5.1	5.0
American Indian or Alaska Native	45.4	40.9	33.0	25.9	9.3	6.4
Native Hawaiian or Other Pacific Islander	*	42.2	*	27.2	4.8	10.0
Asian	40.2	37.2	13.8	13.4	1.9	2.2
Two or More Races	60.5	55.6	29.1	22.8	8.1	8.8
Hispanic or Latino	46.4	48.1	25.7	26.9	5.8	5.5
EDUCATION						
< High School	36.6	36.5	22.9	23.2	6.8	5.8
High School Graduate	51.7 ^b	48.4	26.4	25.2	7.8	7.5
Some College	58.6 ^a	60.8	26.4	26.4	7.9	7.6
College Graduate	68.6	69.2	22.1	23.1	5.9	6.0
CURRENT EMPLOYMENT						
Full-Time	64.8	65.8	29.9	30.5	8.6	8.4
Part-Time	58.6	58.0	25.7	24.5	7.2	6.9
Unemployed	54.9	53.8	32.0	31.3	10.8	10.3
Other ¹	41.3	40.8	13.9	14.1	3.9	3.7

*Low precision; no estimate reported.
NOTE: Binge Alcohol Use is defined as drinking five or more drinks on the same occasion (i.e., at the same time or within a couple of hours of each other) on at least 1 day in the past 30 days. Heavy Alcohol Use is defined as drinking five or more drinks on the same occasion on each of 5 or more days in the past 30 days; all heavy alcohol users are also binge alcohol users.
^a Difference between estimate and 2013 estimate is statistically significant at the 0.05 level.
^b Difference between estimate and 2013 estimate is statistically significant at the 0.01 level.
¹ The Other Employment category includes students, persons keeping house or caring for children full time, retired or disabled persons, or other persons not in the labor force.
Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2012 and 2013.

Safe Drinking Standards

According to the National Institute on Alcohol Abuse and Alcoholism, moderate drinking is defined as 1 drink daily for women and 2 drinks daily for men.³¹ The same reference states that binge drinking is consumption that brings the blood alcohol level to 0.8g/L or 4 drinks in a two hour period for women and 5 for men. It can be assumed that consuming less than these limits is considered light drinking. Individuals who drink more than the standard limits are at

risk for an alcohol use disorder and are considered to be abusing alcohol.³² Those who drink more than recommended limits are also at risk for alcohol dependence, which sets the stage for alcohol withdraw issues. It is prudent to take a look at what neuroscientists have to add to the alcohol abuse scenario considering most do not understand how much alcohol it takes to start manifesting signs, symptoms or neurological damage.

What Neuroscience Has Found

New neuro-imaging technology has allowed neurosciences to study effects of alcohol consumption on the structure, physiology and function of the brain.³³ These scientists have discovered alcohol related structural and functional modifications that are either permanent or temporary.³⁴ Considering the reference above states 47% of service members are binge drinkers, and depending on how long they have been drinking in this manor, the self-damage could be either temporary or permanent even with abstinence. The damage occurs primarily during intoxication and is dependent on the member's health, age, gender and nutritional status as alcohol drives deficiencies.³⁵ Therefore, how much alcohol it takes to start causing damage will vary. Once nutritional thresholds are compromised, and the body is unable to heal and recover, damage ensues. Chronic alcohol consumption is also associated with frontal brain and prefrontal cortex damage.³⁶ This region of the brain (just behind the forehead) is important for goal directed behaviors, sound judgment and the ability to problem solve.³⁷ If a thiamine deficiency is also present, there could be episodic memory loss.³⁸ The frontal lobe of the brain is considered, among other things, the seat of personality. It is involved in impulse control, spontaneity, memory, and initiation, social and sexual behavior. Damage to this area can trigger emotional control issues, easily provoked aggressive behavior and/or inappropriate social behavior. In other words, damage to this region causes the inability to suppress impulses or

urges that if not appropriately suppressed leads to antisocial behavior and sexual assault.

Alcohol can also cause damage to the cerebral cortex which can impair one's ability to process emotions and behavior. It causes a slowing in the processing of sensory information and makes it difficult to think clearly. In addition, cortical atrophy and reduced cortical thickness is caused by alcohol abuse.³⁹ In some cases, if caught early enough, alcohol damage is temporary and reversible. However, continued use will seal permanent damage. Figure one is a standard illustration of the parts of the brain and identifies what parts of the brain are sensitive to alcohol and the difference between regions. Figure two depicts a normal sample compared to a known alcoholic and an individual with Wernicke-Korsakoff syndrome. Notice the structural changes in the frontal lobe, cerebral cortex, corpus callosum and the thalamic regions. Chronic binge consumption also causes white matter damage. White matter is the nerve fibers wrapped in

Figure 1. Brain Structure and Areas of Alcohol Sensitivity⁴⁰

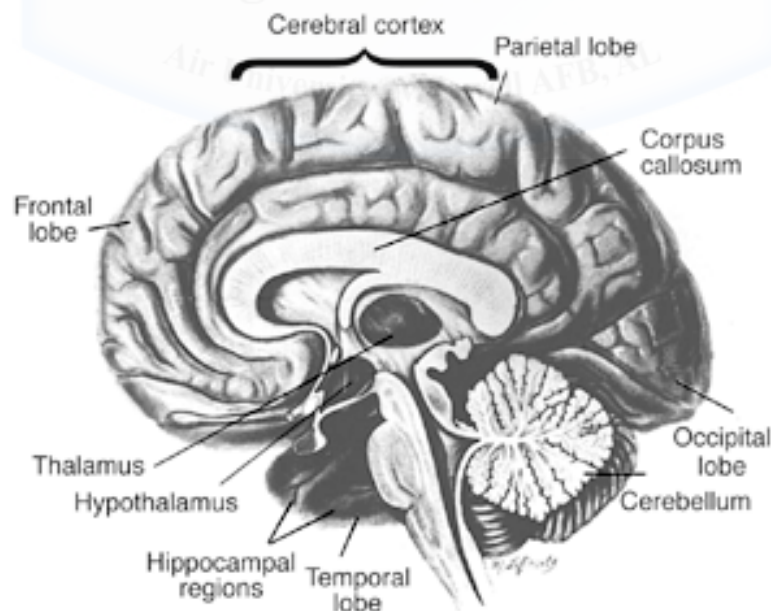
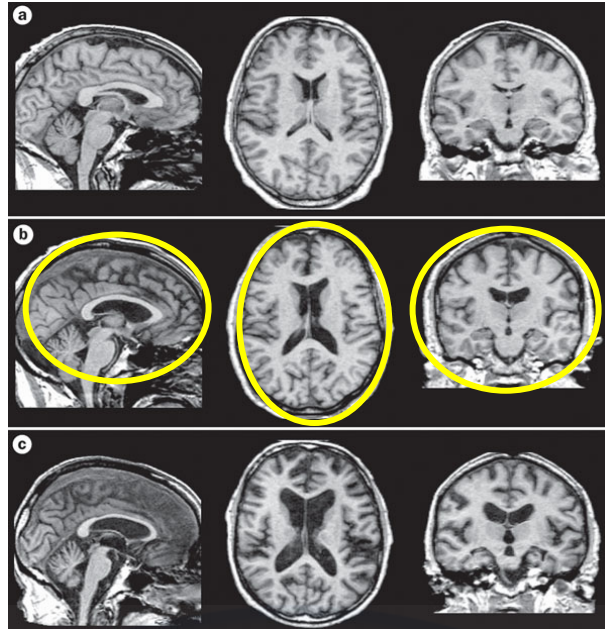


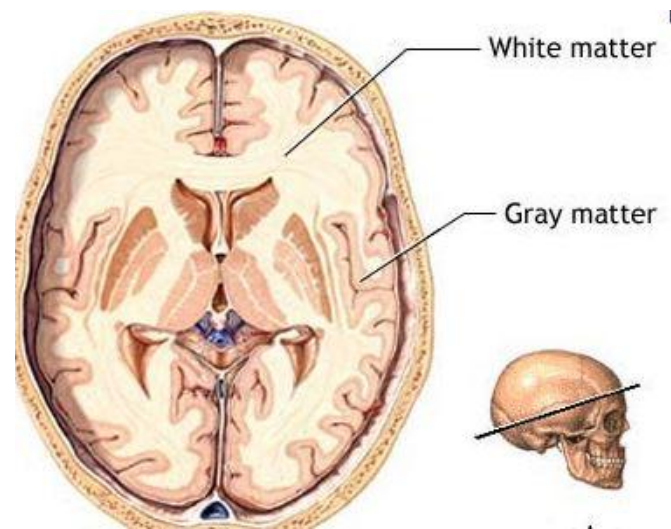
Figure 2. Graded Brain-Volume Deficits in Alcoholism and its Sequelae⁴¹



T1-weighted MRI scans from **a** | a 63-year-old healthy control male, **b** | a 59-year-old man with alcoholism, and **c** | a 63-year-old man with WKS. Graded enlargement of the ventricles (indicating shrinkage of the surrounding tissue) can be observed from the healthy control to the individual with WKS. Sagittal (left column), axial (middle column) and coronal (right column) brain images are shown.

myelin that connects different parts of the brain. Each nerve carries signal impulses between various neurons. The myelin functions as an insulator and ensures speed of transmission. It is understood that regions of the brain need to communicate to carry out normal every day behavior. This is done via white matter. In a landslide study researchers found widespread white matter damage in subjects who were sober after 5 years compared to normal subjects.⁴² White matter damage is also associated with antisocial behavior.⁴³ In fact, white matter damage is specifically indicated in studies of primary psychopaths, the most severe form of antisocial personality manifestation. The figure below displays areas of the brain where white matter and gray matter exist. The importance of these studies from neuroscientists is structural damage is

Figure 3. White Matter and Gray Matter⁴⁴



caused by chronic alcohol use and this structural damage is directly related to function and the causes of antisocial behavior. A 2007 study concluded “antisocial syndromes were significantly associated with alcohol use disorders, with antisocial personality disorder being the most severe presentation”.⁴⁵ If an individual began pattern drinking during adolescence before the brain completed development (by 24 years), the damage could impair intellectual development and create long term neurocognitive deficits.⁴⁶ If the same individual continued to abuse alcohol and cause more damage, it could potentially affect areas of the brain that lead to violence. Alcohol related brain damage during adolescence further sets the stage for antisocial behavior and sexual assault among the college population. It also sets the stage for young service members entering into the military with a predisposition to violence due to the same circumstances. Or if the military culture supports alcohol misuse, the damage could be caused while in the service. In either case, the damage caused by alcohol is not detected. Considering brain damage due to alcohol use can predict antisocial pattern behavior, it is critical to understand what mental health professionals have to say regarding alcohol use disorders and behavior.

Views from Mental Health Professionals

Alcohol use disorders are defined as either alcohol abuse (binge drinking) and/or alcohol dependence. Antisocial behavior syndromes, disinhibition disorders, major depressive disorders, including bipolar disorder, often co-occur with chronic alcohol consumption. The type of damage done determines the different issues and deficits in behavior. The association between alcoholism and Antisocial Personality Disorder has been known for several years.⁴⁷ Therefore, it is important to understand exactly what antisocial behaviors and antisocial spectrum behaviors are; antisocial behavior is having a blatant disregard for others and often violates the rights of others. Antisocial behaviors are often associated with externalizing (extraversion), hyperactivity, aggressiveness, novelty seeking, risk taking and antagonistic or social order opposition. A person exhibiting these traits often lacks guilt and fails to learn from experiences. These behaviors are also generally considered callous and unemotional. The overall diagnosis of an Antisocial Personality Disorder is part of the cluster B personality category according psychological references. The cluster B category also includes Narcissistic Personality and Borderline Personality. Not all individuals who display a few antisocial behaviors are considered to have a disorder. There are variations among the population. According to one study of incarcerated sexual offenders, rapists are more frequently diagnosed with cluster B personality disorders and alcohol or substance abuse.⁴⁸ The table below connects brain impairments with antisocial behaviors. One critical fact is brain damage due to alcohol misuse can imitate any psychiatric disorder.⁴⁹ This makes it difficult for clinicians to determine if the disorders are due to alcohol or other primary causes. It also exemplifies the widespread impairments and deficits alcohol can cause. Finally, researchers in the fields of behavior sciences have indicated antisocial impulses

are often suppressed without alcohol use. Researchers further assert that some individuals consume alcohol to carry out the behaviors they suppress. In this case, the underlying moral

Table 2. Structural Brain Impairment and Behavior⁵⁰

The Translation of Brain Impairments to Risk Factors for Antisocial Behavior

Impaired brain region	Processes/risk factors	Outcome
Frontal cortex		
Dorsolateral	Response perseveration Poor planning/organization Theory of mind	Failure to desist from punished behavior Occupational and social dysfunction, low income Misperception of others intentions/behavior
Ventral–orbitofrontal	Decision making Emotion regulation Mediation of emotional responses guiding behavior	Bad life judgments Poor anger control Poor behavioral control
Medial-polar prefrontal	Empathy/concern for others Moral judgment Self-reflection	Callous disregard for others' feelings/situation Noncompliance with societal rules Lack of self-insight
Limbic structures		
Anterior cingulate	Inhibition Errors /conflict processing	Failure to withhold an antisocial response Difficulty in dealing with conflictual situations
Posterior cingulate	Moral decision-making Self-referencing	Noncompliance with societal rules Poorer attribution of negative life outcomes to self
Amygdala	Fear conditioning Social-emotion judgments Moral emotion Judging trustworthiness	Lack of affect and poor conscience development Misinterpreting others' motives/feelings Noncompliance with societal rules Hypersociability and victimization
Hippocampus	Contextual fear conditioning	Not placing punished responses into social context
Temporal cortex		
Temporal pole–superior temporal gyrus	Theory of mind, social perception	Misattribution of other's motives
Posterior superior temporal gyrus	Moral judgment	Noncompliance with societal rules
Parietal cortex		
Angular gyrus	Moral judgment Sense of responsibility for actions	Noncompliance with societal rules Irresponsible behavior

flaw becomes evident. When alcohol abuse has caused enough damage to areas of the brain that support suppression of impulses (reference table above), uncontrollable violent behavior is likely to take place. If damage to suppressive pathways is temporary, then individuals may experience shame for their drunken behavior once the damage is repaired. If the damage is permanent, they

may feel nothing at all. The difference between temporary and permanent damage is conditional upon an individual's nutritional status.

Nutritional Factors

Nutritional status or the ability to absorb nutrition from a healthy diet is a major factor in alcohol abuse/misuse. Those who cannot maintain a nutritional status that enables them to heal from alcohol intake will be affected by brain related alcohol damage more quickly than those who are still able to absorb nutrition. The amount of damage caused by alcohol to the epithelia cells and microvilli in the intestines is a critical factor in the ability to absorb vitamins, minerals and nutrients. For those who have sustained damage, a cascade of symptoms may begin that mimic many other disease states. Once a single deficiency has been established, other metabolic functions become hindered and can produce variable symptoms. The underlying cause is usually masked by other related symptoms. To metabolize alcohol, the body must pull from its existing resources to convert the substance to glucose. The additional resources required to metabolize alcohol also drives an existing deficiency further. Two of the most notable deficiencies associated with alcohol induced brain damage are thiamine and niacin. Other clinical manifestations outside of brain damage are beyond the scope of this paper.

Thiamine deficiency is associated with beri-beri, causes Wernicke's encephalopathy (also called "wet brain") and other related damage to normal cognitive functions. Thiamine cannot be created by the body, therefore it must be ingested. The body can become depleted of thiamine in approximately 14 days without additional intake through absorption. Thiamine is required in several chemical pathways related to carbohydrate metabolism and other required essential molecules for normal brain functioning (including neurotransmitters). Continued deficiency causes necrosis or cellular death, demyelination of neurons and lesions.

Malabsorption of other vital minerals like magnesium also affects the body's ability to utilize thiamine if it is present. If magnesium is deficient, thiamine cannot be used.

Niacin (or B3) is another critical vitamin associated with alcohol misuse/abuse. Niacin is essential for carbohydrate and alcohol metabolism. Deficiencies in niacin are related to pellagra and pellagrous encephalopathy. The absence of niacin increases the damage related to alcohol consumption specifically because niacin is required to metabolize alcohol. Alcohol stays in the bloodstream longer without niacin and other cofactors to metabolize it. Alcoholic pellagrous encephalopathy presents similar to Wernicke's encephalopathy in a clinical setting.⁵¹

When a heavy drinker suddenly stops consuming, as in the case of a deployment to a location where general order number one is in place, the depressant effect of alcohol is lifted and the brain goes into overdrive attempting to regulate the body's chemistry, without proper nutrition. Such an individual in this circumstance could find themselves in a combat related scenario without the ability to make sound decisions. Given the situation, this service member may also not be able to mentally or emotionally process a combat related event or be able to repress impulses. Without proper medical support, this service member could return with permanent brain damage or sexually assault another service member while down range. The reason sexual assault is a risk during initial abstinence is once the brain does not receive alcohol, brain metabolism is altered to a hyper-state (attempting to regulate changes). Any damage done from alcohol misuse affecting impulse control, emotional regulation and executive functioning would be amplified in the non-depressive state (alcohol is a depressant). In this scenario, the member could become hypersexual without impulse control or the ability to exercise sound judgment. In either case, the member is usually not consciously aware of mental changes or brain damage, though others may notice a change in their behavior. Table 3, below, depicts

associated vitamin deficiencies with clinical syndromes. Table 4 lists the consequences of a magnesium deficiency.

Table 3. Nutritional Deficiencies and Related Syndromes ⁵²

Clinical symptoms of selected vitamin deficiencies

	Function	Deficiency syndrome
Water-soluble vitamins		
Vitamin B1 (thiamine)	Thiamine pyrophosphate	Beriberi - congestive heart failure (wet beriberi), aphonia, peripheral neuropathy, Wernicke encephalopathy (nystagmus, ophthalmoplegia, ataxia), confusion, or coma
Vitamin B2 (riboflavin)	Flavine adenine dinucleotide	Nonspecific symptoms including edema of mucus membranes, angular stomatitis, glossitis, and seborrheic dermatitis (eg, nose, scrotum)
Niacin (nicotinic acid)	Nicotinamide adenine dinucleotide	Pellagra - dermatitis on areas exposed to sunlight; diarrhea with vomiting, dysphagia, mouth inflammation (glossitis, angular stomatitis, cheilitis); headache, dementia, peripheral neuropathy, loss of memory, psychosis, delirium, catatonia
Vitamin B6 (pyridoxine, pyridoxal)	Transaminase cofactor	Anemia, weakness, insomnia, difficulty walking, nasolabial seborrheic dermatitis, cheilosis, stomatitis
Vitamin B12 (cobalamin)	One carbon transfer	Megaloblastic anemia (pernicious anemia). Peripheral neuropathy, with impaired proprioception, and slowed mentation.
Folate	One carbon transfer	Megaloblastic anemia
Biotin	Pyruvate carboxylase cofactor	Nonspecific symptoms including altered mental status, myalgia, dysesthesias, anorexia, maculosquamous dermatitis
Pantothenate	Coenzyme A	Nonspecific symptoms including paresthesias, dysesthesias ("burning feet"), anemia, gastrointestinal symptoms
Vitamin C (ascorbate)	Antioxidant, collagen synthesis	Scurvy - fatigue, petechiae, ecchymoses, bleeding gums, depression, dry skin, impaired wound healing
Fat-soluble vitamins		
Vitamin A (retinol, retinal, retinoic acid)	Vision, epithelial differentiation	Night blindness, xerophthalmia, keratomalacia, Bitot's spot, follicular hyperkeratosis

Table 4. Consequences of Magnesium Deficiency⁵³

Neuromuscular	Central Nervous System
Weakness	Depression
Tremors	Agitation
Muscle fasciculation	Psychosis
Positive Chvostek's sign	Nystagmus
Positive Trousseau's sign	Seizure
Dysphagia	
Cardiac	Metabolic
Arrhythmias	Hypokalemia
ECG changes	Hypocalcemia

The link between nutrition, behavior and mental function has been established. Studies of violent offenders in correctional institutions concluded nutritional supplementation reduced violent antisocial behaviors by 40%.⁵⁴ Alcohol abuse as root cause of violence and antisocial behavior has also been historically linked, but not fully understood until more recently.

A Historical Perspective of Alcohol and Sexual Assault

The U.S. historically attempted to ban alcohol in the early 1920s due to moral and health related issues caused by alcohol consumption. Religious leaders attempted to approach the issue from a moralistic platform and were successful with the Anti-Saloon League along with other supporting organizations. Prohibition was mandated under the 18th Amendment to the U.S. Constitution. Approaching the problem through directive policy and law set the stage for black market sales and more violence. This only served to create a negative sub-culture within the population. Prohibition was soon lifted. During this same decade, another cultural shift was seen when women joined the service force.

Women were permitted to serve in the military in 1917. Sexual assault laws were also not in place and reformation of laws against sexual violence were not established until the 1960s and 1970s.

Historical approaches serve as failed attempts to force alcohol abstinence on the population through law and moral consciousness. Albeit, most understood there was a relationship between alcohol and antisocial behavior, the scientific community did not have the technology to substantiate the circumstance. Science does understand the cause effect relationship now, but alcohol misuse programs in the services do not teach this understanding.

Alcohol and Drug Abuse Prevention Programs in the Military⁵⁵

The military does screen for substance abuse through random testing of its service members. However, once (and if) alcohol misuse is identified, the cognitive behavior therapy focuses on substance refusal and values assessment rather than teaching what alcohol abuse actually does to the brain. The Alcohol Education Module, for those who enter the program, clearly associates alcohol misuse with intimate partner violence and alcohol related sexual assault, but does not explain why.⁵⁶ The training does give facts about causing heartburn, nausea and ulcers. But it does not cover nutritional mal-absorption issues related to misuse, why these conditions happen or the long term affects. Lastly, training does not cover brain damage and how it affects emotional regulation, executive functioning and impulse control. And it does not discuss the difference between permanent or temporary damage and residual metabolic disorders. A comprehensive review of substance abuse programs across the DoD can be found here: <http://www.ncbi.nlm.nih.gov/books/NBK207282/>.⁵⁷

Analysis

Summarizing the facts, 47% of U.S. service members binge drink. The USMC reported 53% of the sexual assaults in 2013 were alcohol related. Binge drinking in the military is more prevalent than in the U.S. population. More sexual assaults take place on college campuses where increased alcohol is consumed. Alcohol abuse drives nutritional deficiencies and causes brain damage which leads to antisocial behaviors. Alcohol abuse can mimic nearly every psychological disorder observed in a clinical setting. Rapists are more frequently diagnosed with cluster B personality disorders. The common denominator between sexual assault, alcohol and antisocial behaviors is brain damage (either temporary or permanent) from alcohol use/misuse. The SAPR program does not include data gathering perimeters to identify alcohol related sexual assaults in the executive reporting process. This obscures the real issue from plain sight. The SAPR program also does not directly address alcohol use and alcohol's effects on the brain in the training curriculum. The ADAPT program does not teach a comprehensive battery covering alcohol induced brain damage as it relates emotional dysregulation, loss of impulse control and executive functioning. Alcohol is a legal substance. Historical attempts to regulate alcohol use through moral and legal means proved ineffective.

Therefore, neither DoD program, SAPR or ADAPT, teaches service members what they need to know about alcohol use and brain damage or how alcohol can temporarily or permanently compromise a member's emotions, impulse control and executive functioning which leads to sexual assault. Leaders have not incorporated new scientific information into training plans. Annual SAPR training is conducted, but annual or biannual alcohol training is not.

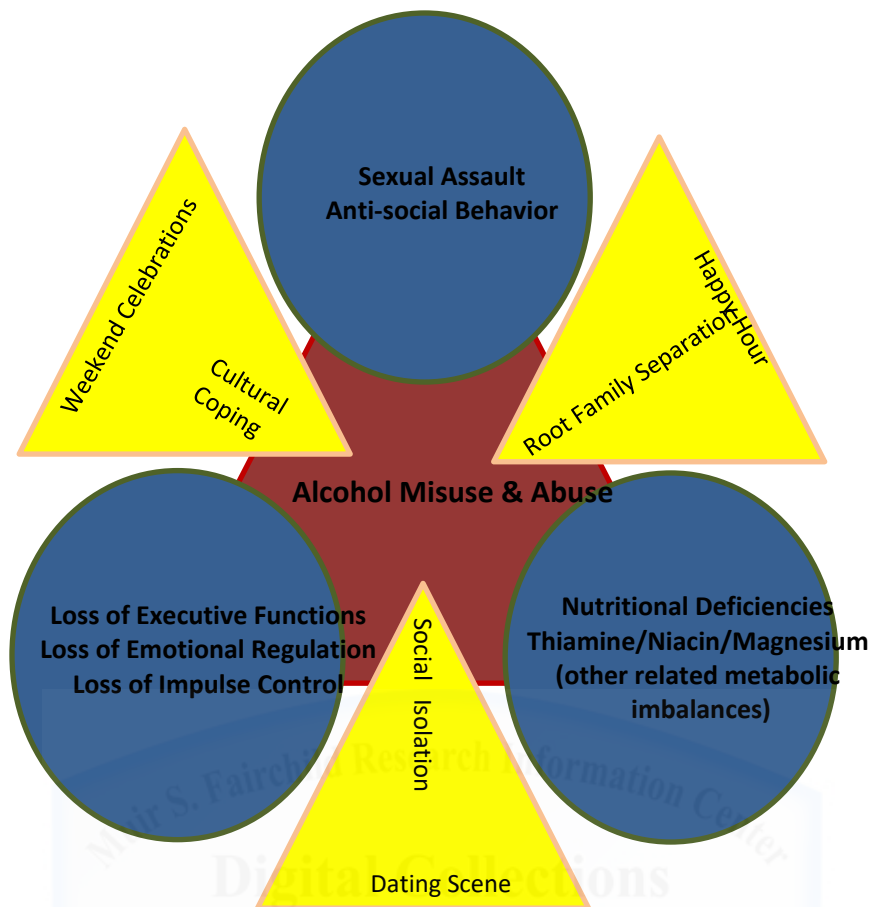
Table 5. Identifying Centers of Gravity

	Annual Training	Antisocial Behavior Related	Sexual Assault Related	Comprehensive Alcohol Education	Point Summary
SAPR	Yes	Yes	Yes	No	3
ADAPT	No	Yes	Yes	No	2

The Socials of Things

The choice to consume alcohol within safe limits rests at the individual level. In other words, it is an individual choice. The reason individuals choose to consume alcohol varies with social patterns of behavior and the ability to cope with stress and change.⁵⁸ If alcohol misuse was a familial pattern of behavior, new service members may not understand the long term damage it can cause or its relationship to antisocial behaviors. Having this information would equip them with a better understanding and the ability to make more healthy choices. The entry

Figure 4. Behavioral Cascades Lead to Functional Programs



point into the service is a center of gravity. To identify where stresses may occur in a service member's life is conditional on the service member's ability cope. Known stressors such as family separation, social problems, fear of combat (or coping with combat related events) and monetary trouble could push an individual to misuse alcohol. What was once a few drinks used to deal with a problem became a nightly habit to cope with daily pains and strains. The flip side of equation is not so dim and grim as there is also the celebratory side of alcohol use that is embedded into U.S. culture. From social happy hour to the weekend single dating scene, to organized sports and more; members could literally celebrate themselves into an alcohol use disorder. What was once having a few drinks during holidays or social events became routine or daily celebrating because of alcohol's initial high. Only to realize the alcohol misuse started to cause social problems, family problems and financial problems or other. Coping pattern drinking

and celebratory pattern drinking are two sides of the same truth as it relates to alcohol misuse. A happy drunken person can sexually assault just as readily as a sad one. The common factor is the affect alcohol has on the individual's brain. From a systemic point of view, due to the broad nature of the issue, change cannot be made dealing with one individual at a time. Therefore an overall mass approach is more suited.

Discussion of Alternatives

One potential alternative is to give commanders flexible use of general order number one in any environment (CONUS or OCONUS) to curb alcohol consumption and themselves abstaining from alcohol while in command. General order number one gives commanders the ability define and prevent service members from engaging in those activities that erode good conduct and could impact mission readiness or effectiveness. This is an unreasonable solution as history has shown that legally or forcibly sanctioning alcohol only produces an undercurrent of dissent and rebellious behavior. While general order number one is necessary in a combat theater, it would be difficult to enforce outside of that scenario (stateside or other).

Another potential alternative is the creation of either joint liaison positions or a joint cell for both the SAPR and ADAPT policy or integration branch. This would allow data sharing and collaboration between staffs. Such an integrated cell would include members from the medical community (neurologists, laboratory scientists and nutritionists), from the behavior health community and from the sexual assault prevention team. The purpose of the integrated process team would be to collect, analyze and share data between functions. This could identify those individuals who have assaulted or have been assaulted and also have an alcohol misuse disorder. It would also allow joint policy creation and integration of a new service wide educational

battery covering the effects of alcohol on nutrition, impulse control, emotional regulation and executive functioning.

A third alternative is to fund an independent organization to create an educational program that incorporates the latest scholarly information on alcohol use and its effects on the body, focusing on related brain damage and associated behavior. Policy makers from both SAPR and ADAPT could incorporate the educational material separately into existing programs and determine the frequency of the training.

The final option is to ignore the information, continue with the current strategy or do nothing different which is an unacceptable course of action.

As mentioned above, general order number one use and ignoring the information is both unreasonable and unacceptable. No change in policy will only enable more sexual assaults to occur. Creating an integrated process team between the SAPR and ADAPT programs is a highly reasonable solution and allows for collaborative policy creation across services. It also allows for data sharing and enables the creation of alcohol misuse intervention for those who have or have been sexually assaulted where alcohol use was documented. Funding an outside organization to create a scholarly educational program is also a reasonable alternative as it allows those scientists who have focused interest on the matter develop a comprehensive program. While there are very knowledgeable members on the SAPR and ADAPT teams, there exist others who are more versed as subject matter experts who have dedicated much time and attention to understanding the relationship between alcohol use and changes in cerebral structures as it relates to behavior. Considering first term service members are a center of gravity to affect personal choices and change at the individual level, instituting an educational program at entry level would be effective with mass reaching effects. In addition, having all

service members complete this training would help members make healthier personal choices and be able to more readily recognize cognitive changes when it occurs. Even if individuals are unable to sense changes in themselves, they would be more open to feedback regarding alcohol use.

Conclusion

Sexual assault is a deadly enemy within the ranks of all military services that has critical impacts to mission readiness, mission accomplishment and individual health. Up until very recently, the relationship between alcohol misuse, antisocial behaviors and sexual assault were unproven and not wholly understood. It is now known and understood that alcohol misuse and binge drinking cause nutritional deficits, devastating changes to the brain's white matter that result in structural changes and antisocial behaviors. The common denominator between chronic and pattern alcohol consumption, antisocial behaviors and sexual assault is vast neurological damage that leads to antisocial behavior. The same antisocial behavior indicated in sexual assault. Senior leaders must inject and incorporate this new information into a new educational strategy for preventing sexual assault and alcohol misuse. By creating a comprehensive educational program developed by scholarly experts in the field and injecting that information into existing programs, measurable change can be affected. Knowledge and understanding is the key to change at the individual level. Without understanding what alcohol can do, service members will continue to make blind choices and we cannot lead a blinded team to mission success. Nor can leaders allow alcohol abuse/misuse and the related result, sexual assault, to continue to be a critical vulnerability through the eyes of an enemy.

Recommendations

The final recommendation is a blend of the second and third alternatives. The DoD should fund an outside organization to create a current educational program covering the damaging effects of alcohol as it relates to neurological damage, antisocial behavior and sexual assault and hand that product off to a newly created a joint integrated process team between the SAPR and ADAPT programs. Leaders will then be able to carve out implementation policy and tools for commanders to utilize at all levels of service. Additionally, adding an alcohol involvement data perimeter to information collection procedures through the SAPR program would greatly enhance visibility of alcohol related sexual assault frequency. It will also create a measureable data point to demonstrate changes in the number of sexual assaults once programmatic changes have been made.

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